Study on Resident's Preferences Towards the Land Readjustment Works by Visual Simulation Procedures : Case Study : The Kobe City's Westerm Urban Fringe

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－Case Study: The Kobe City's Westerm Urban Fringe－

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視覚的手法を用いた区画整理事業に対する住民の選好について －神戸市のアーバン・フリンジを事例として－

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Résumé

The Zenkai district is a rural area located in the urban fringe of Kobe City, that recently has been rapidly developed. The city planning trend has introduced drastic changes in the existing landscape where conflicts in land-use are remarkables. Therefore, the local authority is promoting resident's participation to rural planning. In a previous study,[5] concerning the selection of different types of development to be carried out in the region, an aerial-photograph was used and the result of the opinion of residents was reported at that time. The objective of the present research is to visually understand the contents of that selection. Therefore a site research was performed and the preferences of residents regarding the type of development that should be carried out in areas around the Ikawadani station was studied through the use of visual simulation procedures.

As a result, a wide variety of answers were obtained concerning the concepts of development and conservation. The necessity of a low density development with buildings that maintain an architectural relationship with the old existing communities, was specifically determined. Furthermore, green zones between new structures and along the Ikawa river is an important resource that should be promoted in order to achieve this integration.

要　　旨

神戸市西区伊川谷の前開地区は，神戸市のアーバン・フリンジに位置しているが，急速に開発が進展し，農村の土地利用と景観が変化してきた。このような都市近接農村では，自治体も住民参加による地域計画を実施しようとしている。そこで，調和のとれた地域計画を作成するための住民の意見を知ることが必要になってきた。このような点をふまえ，主として航空写真を用いて景観変化に関する住民の選好を調査し，報告した[5]。今回は，さらにこの選好内容を具体的かつ視覚的に把握するため，同地区を対象に，今後展開される予定の区画整理事業等による開発計画

を検討し，そのいくつかの例のスケッチとコンピューター・シミュレーションを用いて住民の選好を調査した。

結果として，住民の景観に対する選好は開発と保全の間で多様な展開を見せたが，とくに低密度の開発と河川や道路などの帯状緑化が，農村集落景観の保全計画にとって不可欠な要素であることが明らかとなった。

Introduction

Big cities in Japan tend to be surrounded by a periphery zone which is neither urban nor rural. The zone is called urban fringe, and displays different uses and buildings types interspersed with rural lands. In this zone, a continuum process of transformation from rural to urban modes of production has been induced by vested interests to take advan tage of the new transportation systems in order to increase the value of the land.[1] As a result, the landscape in these areas shows conflicts between new development features and the old local traditions.

The urban fringe of Kobe City is benefited from the land consolidation program subsided by the local government, but recently, a rapid urban advance carried out by developing projects (Kobe City's Master Plan, 1986) has drastically affected the landscape in old rural districts. Zenkai is one of those districts, which is closed to the new city's metro line (Ikawadani station). According to the master plan, the local government has designated this area for Land Readjustment Works[2] (Kukakuseiri-jigyo) in order to improve local agriculture as well urban development. As a first stage, residents who are living in this area will temporally pool their holdings within a framework of a public law according to a plan. Nevertheless, an active residents' participation is not developed yet, and decisions could be influenced by strong vested interests. This fact might not satisfy public expectation.

In planning, questions like: "What do residents like?," "Are they one in their opinion?," "What relationships are there between development and preferences?," need to be answered in the process. The methodologies also need to demonstrate an integrative approach with the implementation of techniques used in landscape architecture. One of those, is the visual simulation, that has an increasing relevance in recent years. Studies on its evolution along history[3,4] has show the importance of communicating proposals. Some of the earliest ones were drawings and sketches. Later, photographs and aerial-photographs became available. Most recent ones are divided in two categories: Static Simulations (as computerized photomontages that visualize a proposed project from a static point of view), and Dynamic Simulations (as computer animation or video films where the project is seen by a moving point of view). In our study, the Static Simulations were used because it can best be performed in a photorealistic way, which is difficult and labour intensive by Dynamic Simulations.

Research Objective

This research is based on a previous study,[5] where the main objective was the identifi-

cation of public preference about the existing landscape and future developments to be carried out in the district. The study concluded that old and new residents have different kind of perceptions, but most of them desired the construction of facilities around the Ikawadani station in order to satisfy their basic needs. The objective of the present research is to visualize by computer simulation, the results of resident's preference towards previous proposed landscapes, in order to know how this area should be developed.

Research Area

Zenkai district is an agricultural area crossed by the Ikawa river. Unfortunately, this river scenery is being modified by canalization according to the new road-bridges network plan between communities.[6] A study that has evaluated the opinion of residents regarding the scenery of the river[7] has shown that they are against concrete structures, and desire extensive green zones for recreation and protection against floods.

The Nippon Ryokka Center[8] has organized the district into three landscape zones which correspond to the location of the three main rural communities. These zones are as follows: (1) Agricultural Landscape Zone (Zenkai Shimo); (2) Rural Village Landscape Zone (Zenkai Naka); (3) Historic Landscape Zone (Zenkai Kami). According to the study, the historic zone has the greatest landscape value, due to the location of Taisan-ji temple and it natural surrounding that offers a tourist potential; However, the agricultural zone is considered to have the lowest value, due to development of many urban structures as the Ikawadani station.

Recently, local government began preliminary works for urban development around the station. A study made on resident's preferences,[5] determined that urban facilities are desired (Hospital, Stores, Parking lot, and Supermarket have been requested). This fact shows similar results to the local government's programs. However, due to delicate environmental quality, study on resident's visual preferences could better help the authorities to achieve the desired balance.

Methodology

The study was divided in two stages (Figure 1). In the first one, preliminary studies were made by photographs and drawing simulations (sketches). The results were analyzed to obtain preferences based on three main environments (living, road and regional landscape). The second stage was based on the first one and used the computer simulation technique to elaborate proposals for an urban development pattern around the station. This simulation technique involves methods of putting selected ideas into a visual form, then urban elements were inserted and organized to show different types of expressions. The impact that each element has with others was evaluated by residents in order to know how final landscape should be designed.

In the first stage, public opinion was requested by a survey that used visual patterns. The stage was conducted in Nov.'95 to different group of residents. Those are as follows:

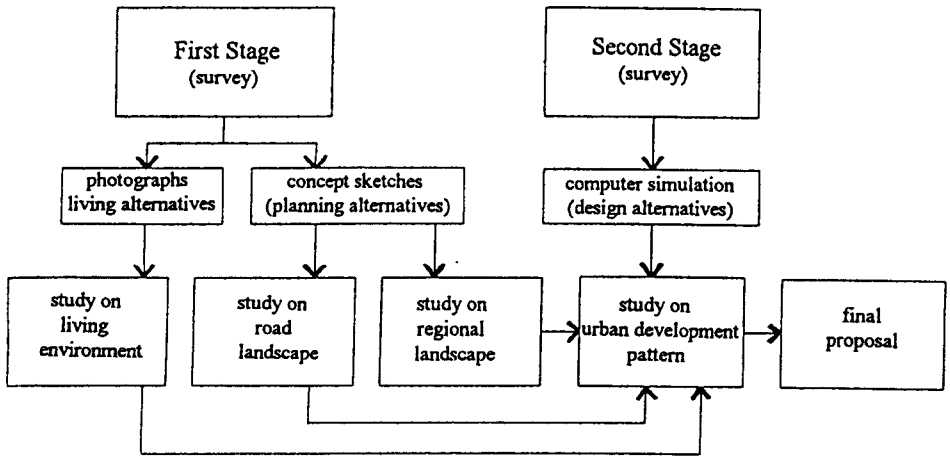

Figure 1. Scheme of research plan

(a) Group 1 (Neighborhood Association (or Jichikai)); (b) Group 2, 3 and 4 (Residents of the three main communities in Zenkai district (Shimo, Naka and Kami)); and (c) Group 5 and 6 (Junior and High school students who lives in the district).

As introductory questions, residents were asked about their years of residence, occupation, age and sex. Later, about a place where recently a pleasant and unpleasant change had occurred in the district. Finally, from four types of established opinions about urbanization trends, they selected the one that was closest to their idea. The main body of the questionnaire was divided into the following three sections:

(1) Section One (About living environment): Six panels of photographs representing different living environments were shown. Residents selected in an orderly manner from the best to the worst environment and wrote the reason about why they want to live there or not. Panels are as follows: Panel 1: (rural landscape), Panel 2: (mixed urban and agricultural landscape), Panel 3: (private houses with small parks and sports facilities), Panel 4: (commercial area), Panel 5: (well-planned residential area with shopping center), and Panel 6: (residential area with high rise buildings).

(2) Section Two (About road landscape): From a picture taken on district's main road were elaborated three sketches to represent different scenaries. Residents selected, in an orderly manner from the best to the worst proposal and wrote their reason. Sketches are as follows: Sketch 'a': (current rural landscape); Sketch 'b':(walking paths, parking lot, and traditional houses); Sketch 'c': (buildings, hotel, parking lot, and gas station).

(3) Section Three (About regional landscape): From an aerial-photograph taken at 45 degrees, five sketches were prepared (Figure 2). Each one represented different types of greenery and urban density based on the current developed project that have been carried out around this area. Similar to previous questions, residents selected from the best to the worst proposal and wrote their reasons. Sketches are as follows: Sketch "A" (current rural landscape with greenery along river); Sketch "B" (about 20% of development by small

buildings); Sketch "C" (greenery along river and about 20% of development by small buildings); Sketch "D" (about 40% of development by high buildings); Sketch "E" (greenery along river and about 40% of development by high buildings).

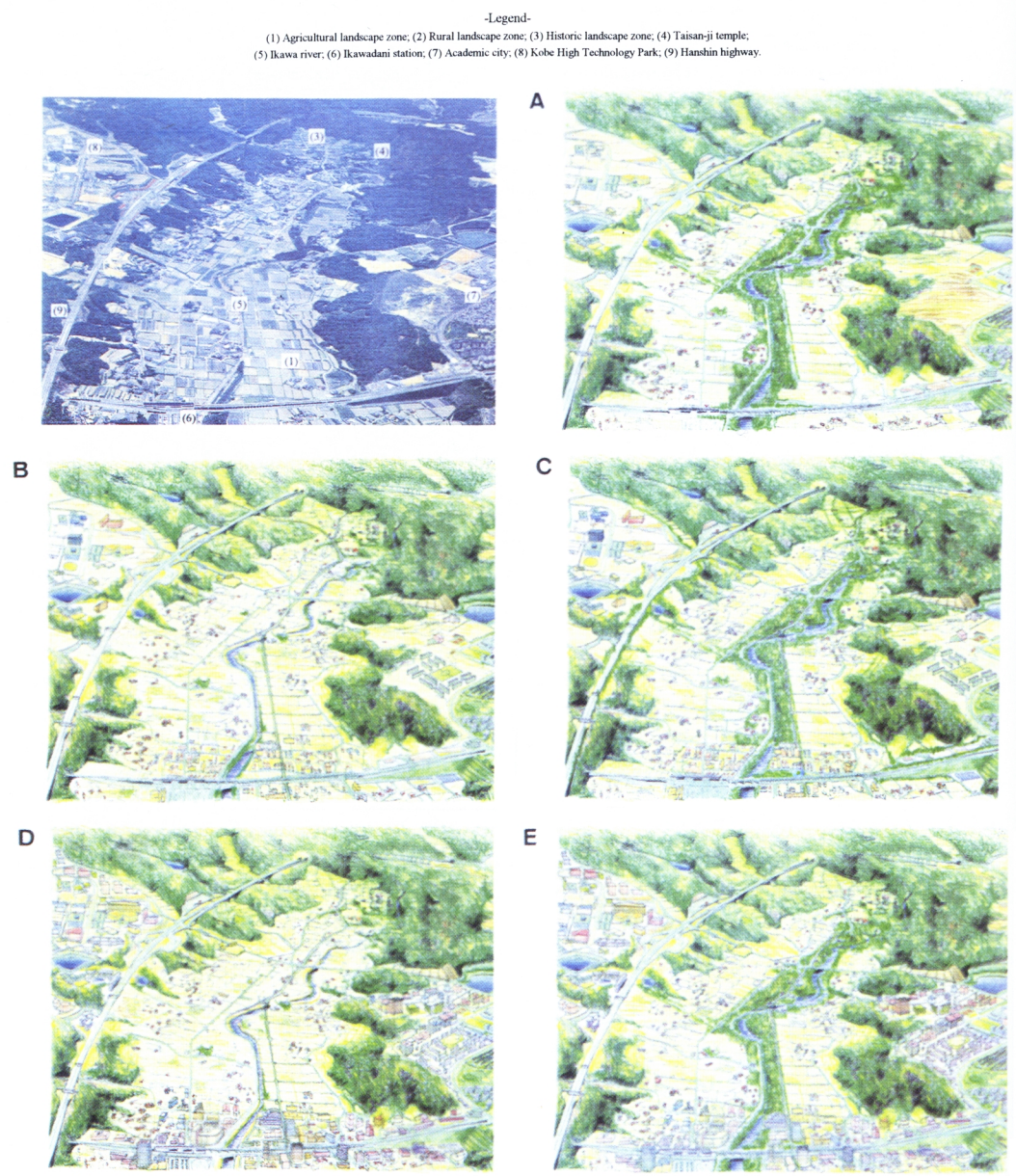

Figure 2. Aerial-photograph and skeches for the regional landscape survey

Noted: Sketch "A": current rural landscape with greenery along river
Sketch "B": about 20% of development by small buildings
Sketch "C": greenery along river and about 20% of development by small buildings
Sketch "D": about 40% of development by high buildings
Sketch "E": greenery along river and about 40% of development by high buildings

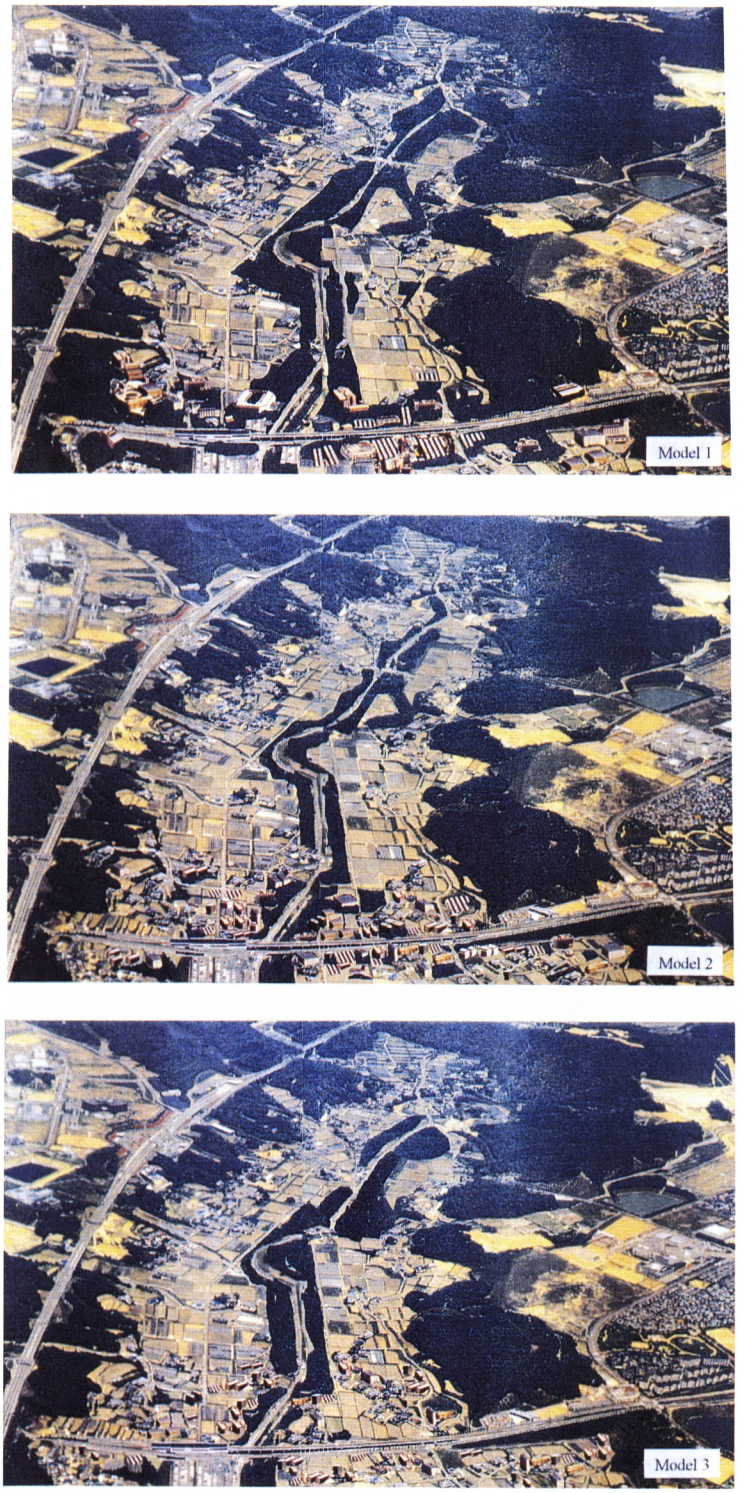

Figure 4. Models designed by computer simulation and based on resident's opinion

Analysis

In the first and second stage, the analysis were made by statistical procedures based on the number of residents interviewed. The percentage of selection of every sketch was taken by groups of residents and represented by levels of preferences, in order to make a comparison. Later, percentage of selection of all the residents by each section of the questionnaire was obtained to find the highest and lowest degree of preferences in all the district. Preferences obtained in the first stage were represented by keywords and visually illustrated by computer simulation in the second stage.

Results and Discussion

A) Results and Discussion of the First Stage (preliminary studies)

As result, 150 residents were interviewed (Table 1). Main features are as follows: (a) 43.9% of the residents have been living in the district for more than 20 years, where their

Table 1. Personal data of respondents (%)

		Gro.1	Gro.2	Gro.3	Gro.4	Gro.5	Gro.6	Total
No. of Respondents:		30	22	15	15	43	25	150
Length of Residence:	Less than 2 years	0	9	0	0	0	4	2
	From 2 to 5 years	0	4.5	6.6	0	0	16	4
	From 5 to 10 years	0	4.5	0	26.6	11.6	32	12
	From 10 to 20 years	0	9	20	13.3	88.3	48	38
	From 20 to 30 years	3.3	36.3	60	13.3	0	0	13.3
	More than 30 years	96.6	36.3	13.3	46.6	0	0	30.6
Occupation:	Company or Government	10	13.6	20	20	0	0	8
	Self-employed	3.3	0	0	0	0	0	0.6
	Agriculture	76.6	40.9	20	33.3	0	0	26.6
	Freelance	0	0	0	0	0	0	0
	Housekeeper	0	22.7	26.6	6.6	0	0	6.6
	Student	3.3	4.1	0	6.6	100	100	47.3
	Un-employed	3.3	4.1	13.3	20	0	0	4.6
	Others	3.3	13.6	20	13.3	0	0	6
Age:	Less than 29 years	3.3	4.5	0	0	100	100	46.6
	From 30 to 39 years	3.3	9	13.3	26.6	0	0	6
	From 40 to 49 years	30	36.3	6.6	20	0	0	14
	From 50 to 59 years	33.3	18.1	40	6.6	0	0	14
	From 60 to 69 years	23.3	27.2	33.3	46.6	0	0	16.6
	More than 70 years	6.6	4.5	6.6	0	0	0	2.6
Gender:	Male	100	13.6	33.3	33.3	39.5	32	45.4
	Female	0	86.3	66.6	66.6	6.04	68	54.5

Table 2. Selected opinions towards urbanization trends (%)

	Gro.1	Gro.2	Gro.3	Gro.4	Gro.5	Gro.6	Total
Opinion No.1	10	13.6	0	0	2.3	0	4.7
Opinion No.2	30	4.5	33.3	20	27.2	72	34.6
Opinion No.3	43.3	63.7	53.4	66.7	48.8	28	48.6
Opinion No.4	16.7	18.2	13.3	13.3	11.7	0	12.1

−Legend−

Opinion No.1: Since there are many inconveniences, I want the urbanization to develop more

Opinion No.2: Since I feel that there are few inconveniences, I would like the urbanization to develop more

Opinion No.3: Since I do not have inconveniences, it is the same to me whether urbanization to develops or not

Opinion No.4: Since urban development brings many problems, I am against the urbanization

main occupation is agriculture, and (b) Students represent the biggest group (47.3%) that represent the 46.6% of residents under 29 years old.

According to Table 2, most of the residents (48.6%) shown apathy toward urbanization trend because although they do not have inconveniences, they feel how the environment has been affected by changes (Opinion No.3). This is felt more clearly in the communities where old residents lives. On the other hand, due to lack of urban facilities, another group of residents wants that urbanization to advance more (Opinion No.2). The High school students (group 6) feel this need more (72%), because due to their age, they are more inclined towards urban amenity. Residents who are against urbanization (Opinion No.4) are old ones (groups 1 to 4), and residents who want a large scale development (Opinion No.1), are representing the lowest percentage (4.7%). Only People who lives near the Ikawadani station (Group 2) could desire such kind of development maybe due to some benefits from the land readjustment policy.

Residents selected Ikawadani station as the most pleasant change (Table 3). When the station was opened (1987), they were grateful to have direct connection to city center. The building was assigned as a "very useful," and the comment: "city life convenience and farmland environment are living together" shows this deal. Only few residents classified it as unpleasant change, where opinions were more related to dangerous traffic and bad environment quality. Another recent change, The Academic Town (Gakuen-toshi), was also considered as useful change due to the shopping areas located near it's subway station. On the other hand, natural places as Taisan-ji temple, Ikawa river, farmland and mountains were considered pleasant places because in those are the history of the region. In regard to the river, even concrete restoration works have been done, it are well accepted because now peoples can walk near riverside.

As unpleasant change, streets represent the most dangerous place, narrowness and fast vehicles in transit are main reason. Kobe High Technology Park was considered as unpleasant place, due to industries and lack of greenery, also it was qualified as "no needed" because it does not contribute to improve resident's daily life.

As a result, we can say that nearby developing areas are considered pleasant changes if they offer proper services to resident's. The use of the keyword "convenience" for selecting

Table 3. Selected pleasant and unpleasant changes (%)
Note: As was determined Table 2, abstention was due to residents' widespread apathy toward urbanization

Pleasant change	%	Unpleasant change	%
Ikawadani station	16.6	streets	8.6
Academic city	10.6	H.technology park	8
Taisan-ji temple	9.3	bus stop schedule	5.3
Ikawa river	5.3	Ikawa river	4.6
farmland	4	Zenkai district	4.6
mountains	4	Kodera district	4
r. restoration works	2.6	Academic city	4
Sports park	2	Seishin-chuo town	3.3
Radium hot spring	1.3	garbages on street	1.3
Seishin-chuo town	1.3	vehicle repair shops	1.3
sanctuaries	1.3	Ikegami kita beppu	1.3
Coops Days	1.3	animal cementery	1.3
Arise district	1.3	Fuze batake	1.3
		Niigata district	0.6
		Akawa district	0.6
		Karaoke box	0.6
		Lossed ponds	0.6
		destroyed mountain	0.6
		golf links	0.6

landscape proposals (see keyword in Table 5) clearly shows this fact. On the other hand, inside the district, residents are against large scale development, and only the improvement of "greenery/farmland" is desired. This common attitude could be defined by planners as "Nimby" (not in my back yard),[9] which reflects the preference of the community against to large scale development of vested interests.

A.1) Evaluation of Preference by Group of Residents

A.1.1) Results of Section One (living environment):

Table 4 shows selected panels by level of preference. The levels are divided by numbers, where No.1 indicates the most preferred panel or sketch, and No.6 (for living environment), No.3 (for road landscape) and No.5 (for regional landscape) represent the most hateful one. Panel 6 (residential area with high rise buildings) was chosen by all the groups as worst environment. Main reasons are lack of greenery and high rise buildings. Panels 4 (commercial area) and 5 (well-planned city with shopping areas) shows also high percentage in levels No.4 and No.5, indicating that those are also bad environments, mostly due by the urban density. This fact is seen more clearly in residents of the communities due to their feeling of rejection towards nearby new urbanization in Seishin, Ikegami, Kodera, Niigata, and Akawa districts (see Table 3).

The best living environment is represented by Panel 1 (rural landscape). The panel was selected from groups 1 to 5 due to the following keywords: "greenery" and "peace/relax" environment. Group 5 (Junior school students) shows also a notable preference for mixed urban and agricultural landscape (Panel 2), and private houses with small parks and sports facilities (Panel 3). According to their way of written opinions and the age (12 to 14), preference are inclined more towards a familiar or domestic environment which offer areas to play. Group 6 (High school students) with more advanced age (15 to 17) did not prefer those landscapes, and were more inclined towards Panel 5 (well-planned residential area with shopping center), due to urban amenity. This variation in evaluating the

Table 4. Selected visual pattern by groups of residents in each section of the questionnaire (%)

Note 1: Points indicate the highest percentage of selection

Note 2: Level of preference areindicatedby numbers, where No.1 represents the best selected proposal, and No.6 (for living environment), No.3 (for road landscape) and No.5 (for regional landscape) represents the worst one

	Section One: Panels for living environment							Section Two: Sketches for r. landscape				Section Three: Sketches for regional landscape					
	Panel	Level of preference:						Sket.	Level of preference:			Sket.	Level of preference:				
		No.1	No.2	No.3	No.4	No.5	No.6		No.1	No.2	No.3		No.1	No.2	No.3	No.4	No.5
Group No.1: Neighborhood Association	p.1	·63.3	20	3.3	0	0	10	a	·36.7	26.7	36.7	A	16.7	10	16.7	6.7	·50
	p.2	13.3	·53.3	16.7	3.3	10	3.3	b	·36.7	·50	13.3	B	16.7	26.7	·33.3	13.3	10
	p.3	16.7	3.3	·66.7	10	0	3.3	c	26.7	23.3	·50	C	26.7	·33.3	16.7	23.3	0
	p.4	3.3	3.3	10	·76.7	10	0					D	·33.3	13.3	10	23.3	20
	p.5	0	6.6	3.3	10	·73.3	3.3					E	6.7	16.7	23.3	·33.3	20
	p.6	3.3	13.3	0	0	6.7	·80										
Group No.2: Community of Zenkai Shimo	p.1	·54.5	9.1	18.2	0	9.1	9.1	a	40.9	45.4	13.6	A	27.3	27.3	27.3	0	18.2
	p.2	0	22.7	·31.8	18.2	9.1	9.1	b	·50	·50	0	B	0	0	·50	·45.4	4.5
	p.3	13.6	·40.9	27.2	18.2	0	0	c	9.1	4.5	·86.4	C	·54.5	·40.9	0	9	0
	p.4	0	0	4.5	18.2	·45.4	40.9					D	4.5	4.5	0	22.7	·63.6
	p.5	13.6	18.2	18.2	·31.8	13.6	0					E	13.6	27.3	22.7	22.7	13.6
	p.6	18.2	9.1	0	13.6	22.7	·40.9										
Group No.3: Community of Zenkai Naka	p.1	·53.3	13.3	26.7	0	0	6.7	a	·46.7	40	13.3	A	26.7	·53.3	20	0	0
	p.2	6.7	13.3	13.3	·33.3	26.7	6.7	b	·46.7	·53.3	0	B	0	0	20	·73.3	6.7
	p.3	26.7	·60	6.7	6.7	0	0	c	6.7	6.7	·86.7	C	·60	40	0	0	0
	p.4	0	0	6.7	6.7	·33.3	·53.3					D	0	0	0	6.7	·86.7
	p.5	6.7	13.3	·46.7	26.7	6.7	0					E	13.3	6.7	·60	20	6.7
	p.6	6.7	0	0	26.7	·33.3	33.3										
Group No.4: Community of Zenkai Kami	p.1	·73.3	13.3	13.3	0	0	0	a	·60	33.3	6.7	A	46.7	33.3	13.3	0	6.7
	p.2	0	·53.3	·33.3	20	0	0	b	40	·46.7	13.3	B	0	20	·53.3	13.3	13.3
	p.3	13.3	26.7	20	·33.3	6.7	0	c	0	20	·80	C	·53.3	·46.7	0	0	0
	p.4	0	0	0	·33.3	·46.7	13.3					D	0	0	20	26.7	·53.3
	p.5	13.3	0	·33.3	13.3	13.3	6.7					E	0	0	13.3	·60	26.7
	p.6	0	6.7	0	0	13.3	·80										
Group No.5: Junior High School	p.1	·37.2	20.9	16.2	4.7	11.6	9.3	a	46.5	·51.1	2.3	A	·62.8	30.2	4.7	0	2.3
	p.2	25.6	·34.8	18.6	14	2.3	4.7	b	·48.8	46.5	4.7	B	4.7	4.7	·44.1	34.8	9.3
	p.3	20.9	·34.8	·34.8	6.9	2.3	0	c	4.7	2.3	·93	C	20.9	·60.4	16.2	2.3	0
	p.4	0	2.3	16.2	·41.8	25.5	14					D	0	4.7	2.3	11.6	·83.7
	p.5	14	6.9	6.9	30.2	·37.2	2.3					E	11.6	0	32.5	·51.1	4.7
	p.6	2.3	0	6.9	2.3	20.9	·69.7										
Group No.6: High School	p.1	4	8	8	28	24	28	a	24	·68	8	A	8	16	·60	12	4
	p.2	4	8	4	·32	·40	8	b	·76	20	4	B	0	4	20	·48	28
	p.3	24	·32	20	16	8	0	c	0	12	·88	C	·52	·40	8	0	0
	p.4	28	16	·28	0	16	8					D	4	0	0	28	·68
	p.5	·32	28	24	4	8	4					E	36	·40	12	12	0
	p.6	8	8	16	20	4	·52										

landscape is based on each group's experiences, age, and cultural background, as it is mentioned in a study on environmental perception[11]

A.1.2) Results of Section Two (road landscape):

All groups choose sketch 'c' (buildings, hotels, parking lot and gas station) as worst proposal (Table 4). The keyword "too much development" represents main reason (Table 5). The sketch 'b' (walking paths, parking lot and traditional houses) was selected as the best one because rural environment is conserved and improved by urban facilities that do not offer landscape alteration. As one resident says: "if the district does not show improvement, there is no significance," shows the importance to achieve the "balance" (see this keyword in Table 5). The sketch 'a' (current rural landscape) was located in the second level of preference because there is not improvement, but it shows a close rate to sketch 'b' due to resident's valorization towards the rural landscape.

A.1.3) Results of Section Three (regional landscape):

Most of residents (groups 2, 3, 4 and 6) chose sketch "C" (greenery along river and 20% of development by small buildings) as best proposal (Table 4). This sketch represents a suitable balance for them, and also was placed in the second level of preference (No.2). In Sketch "A" (current rural landscape with greenery along river) an urban development was not represented, but due to greenery, it shows the second highest percentage of selection. This fact is represented in Table 5 by the keyword "greenery" that shows the need for a buffer zone to maintain "urban/rural balance." In spite of this, neighborhood association (Group 1) selected sketch "D" (about 40% of development by high buildings) because "it promotes city development." This fact shows a paradox, because group 1 do not represent resident's desire. Group 1 shows also difference between their own opinions, they choose panel 1 (rural landscape) as best living environment but prefer city's development. This fact could be influenced by their close contact with local government in several meetings for discussion of the regional problems and its development.

On the order hand, Group 5 (Junior high school) are the only one who selected sketch "A" as best proposal. As it was mentioned before, their tendency towards familiar or domestic landscape could be related to their short age. Since they are the youngest group, they do not realize the needs of the district; later, when they become mature, they will understand this fact better and their preference will change as in Group 6 (High school students) who also selected sketch "C."

In regard to the worst environment, most of the groups (from group 2 to 6) selected sketch "D." Table 5 shows main reasons based on the following keywords "high buildings", "too much development" and "no greenery." Group 1 (neighborhood association) chose sketch "A" as bad proposal, since does not satisfy their need for city development. This fact is repeated again and confirms the paradox in opinion that we mentioned before.

A.2) Evaluation of Preference in all the Residents

The all resident's percentage of selection was obtained by each section of the questionn-

Table 5. Reasons for selection of visual patterns in each section (by percentage of main keywords)

Section One: Panels for living environment			
Keywords for good panels	%	Keywords for bad panels	%
nature/greenery	31.3	high buildings	23.3
urban/rural balance	26.6	too developed	12.6
convenient	13.3	few/no greenery	11.3
peace	10	no ur./ru. balance	9.3
relax	7.3	inconvenient	7.3
good for expenrience	4.6	traffic	6
residential	1.3	high density	4.6
clean air	1.3	unpleasant	4
good for childrens	0.6	not easy to live	3.3
human	0.6	stress	3.3
		air pollution	3.3
		nature destruction	2
		sad	2
		garbage	1.3
		cold	1.3
		no healthy	1.3
		bad for childrens	0.6
		artificial	0.6
		bored	0.6
		too much farmland	0.6
		dirty	0.6

Section Two: Sketches for road landscape			
Keywords for good sketchs	%	Keywords for bad sketches	%
greenery/farmland	42	too developed	24
urban/fural balance	22	no ur./ru. balance	12
relax/walk	7.3	nature destruction	11.3
parking area	6	gasoline station	8
amenity	0.6	not related to region	2
street maintenance	0.6	stress	2
gasoline station	0.6	unpleasant	2
		trafic	2
		air pollution	2
		not greenery	0.6
		inconvenient	0.6
		sad	0.6

Section Three: Sketches for regional landscape			
Keywords for good sketchs	%	Keywords for bad sketches	%
greenery	54.6	few/no greenery	43.3
urban/rural balance	19.3	too developed	18.6
urban develop	10	traffic	5.3
realistic	2.6	high buildings	4.6
peace/relax	2.6	air pollution	4.6
good maintanance	2	nature destruction	4.6
farmland	2	too much dwellings	2.6
city scape	2	no developed	2.6
comfort/convenient	1.3	not related to region	2
river protection	1.3	too much greenery	2
related to the region	0.6	no realistic	2
small buildings	0.6	high density	1.3
		bored/sad	1.3
		artificial	0.6
		no maintenance	0.6
		stress	0.6
		not easy to live	0.6

aire. In Figure 3, the Panel 1: (rural landscape), Sketch 'b': (walking path, parking lot, and traditional houses), and Sketch"C": (greenery along river and 20% of development by small buildings) appears as best preferred proposals, while Panel 6: (residential area with high rise buildings), Sketch 'c': (buildings, hotel, parking lot and gas station), and Sketch "D": (about 40% of development by high buildings) were selected to indicate bad proposals.

B) Results and Discussion of the Second Stage (computer simulation)

In the second stage, the selected three best environments were studied in order to elaborate three models made by computer simulation. Each model represented an urban proposal base on resident's opinion which were inserted in the aerial-photograph originally used. Public opinion was requested again by a survey conducted in Feb.'96, where 50 respondents from the communities were interviewed.

The Models (Figure 4) were designed according to the preferences obtained by groups. The contents are as follows: (a) Model 1: satisfy preferences of groups 2, 3, 4, and 5

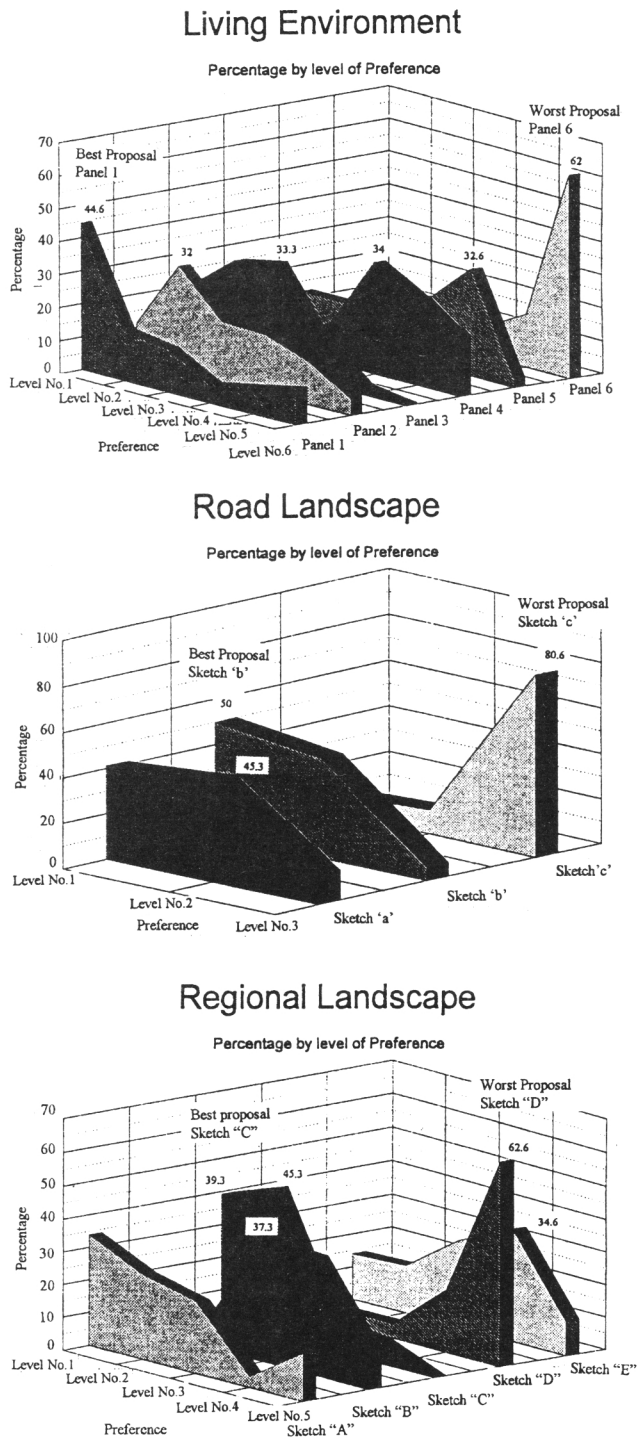

Figure 3. Selected visual patterns by all residents in each section of the questionnaire (%)

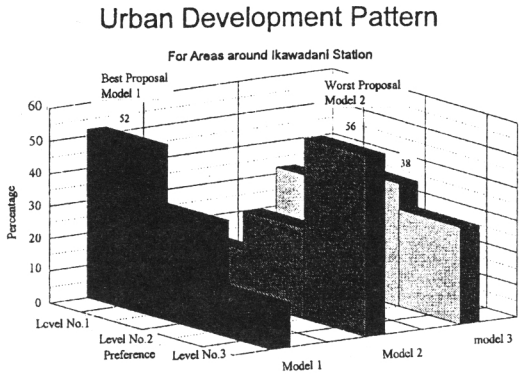

Figure 5. Selected models by level of preferences (%)

by greenery along river, low density development with predominance of vegetation between well designed buildings; (b) Model 2: satisfy preferences of groups 1 and 6 by greenery along river, low density development with predominance in city's environment, facilities and residential areas; (c) Model 3: satisfy preferences of groups 2, 3, and 4 by greenery along the river, low density development with predominance in agricultural landscapes, walking path and traditional villages scattered on farmland.

As result (Figure 5), Model 1 was selected as best proposal with a 52% of selection rate in level No.1 (good preference). Main reasons can be seen in Table 6 by the keywords "greenery" (32%), "farmland protection" (22%), and "natural protection" (18%). Those keywords appear again for selection. Studies on psychological effects of vegetation[10] argued that urban greenery and natural views tend to be therapeutic compared with urban scenes in terms of reducing stress and anxiety. We think that this selection could be influenced by the visualization of this type of image by people that have an expectative toward development. In second level of preference (No.2), Model 3 was selected because promotes rural landscape while basic urban services are offered (38%). Inside this level, Model 1 achieved a very close rate (34%) to Model 3, indicating its predominance.

The worst proposal was Model 2 (56%), located in level No.3 because, even the river is conserved by green zones, only urban structures are promoted around the station. This fact is represented in Table 6 by the keyword "undesired development," and refutes the development idea that local government has.

During the survey, most of the residents showed indifference or reluctance to give their own opinion. They have an idea of the development that will be carried out, and as they said, it is similar to Model 2. This fact shows that resident's decision need to be taken into account for future planning decision.

Conclusion

Resident's preferences on landscape and type of development that should be carried out for the Ikawadani station was studied by visual simulation procedures. The results are

Table 6. Reasons of selecting model by all residents (by percentage of main keywords)

Keywords for good models	%	Keywords for bad models	%
greenery	32	undesired development	34
formland protection	22	environmental problem	9
nature protection	18	few greenery	8
development	10	no planned	8
good scenery	8	no nature conservation	6
urban/rural balance	6	bad scenery	4
nice buildings	4	not interesting	4
		farmland problems	4
		inconvenient	2
		no farmland protection	2
		traffic	2
		dirty	2
		no developed	2

as follows:

(1) Residents have different types of preferences concerning the concepts of development and conservation. They interpreted the environment in terms of their needs and prefer development in which they can harmoniously life. A low density development with predominance in greenery between buildings and the Ikawa river is desired as the best way to integrate new development area into the existing agricultural landscape.

(2) Residents have an attitude of apathy towards urbanization trend, but urbanization is required to be developed more. Inside the district they prefer only the improvement of rural landscapes, while outside the district, in nearby urbanized areas (as Academic Town and Ikawadani station) the development was considered as a pleasant change, because services improve the daily life. On the other hand, the Kobe High Technology Park was considered as unpleasant place due to many industries and the lack of these services.

(3) The research confirms results of previous studies where Ikawa river should be conserved by green zones in order to create a buffer zone against urbanization. The neighborhood association who represents the communities in planning decision does not represent their desired. Residents shows variety in their preferences according to their age. Finally, we can say that studies on visual simulation can promote participation, because it have a measurable effect on people. This visualization can be used as an important tool in planning, if it is integrated early in the planning process.

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